CONCLUSIONS CONCERNING CHOLERA.

CAUSES AND PREVENTIVE MEASURES.

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PRACTICAL CONCLUSIONS CONCERNING CHOLERA. — EVIDENCE RESPECTING CAUSES AND PREVENTIVE MEASURES.

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New York.

Cholera has prevailed extensively in the United States during eight out of the forty-one years since its first appearance upon this Continent. But in only four out of the eight years, as we have reason to conclude, was this pestilence freshly introduced to the United States from Europe. The new importations of the exotic germinal cause were abundantly witnessed in the years 1832, 1848–49, 1854, 1865–66. The arrival of emigrant ships and large companies of emigrants infected with cholera late in Autumn and early in the Spring, in the second and the fourth of these visitations became associated with the most definite and unquestionable of all the evidence we have witnessed upon this Continent respecting the direct dependence of the cholera in America upon cholera in Europe.

Looking back upon the historical records of Asiatic cholera they now appear to be entirely consistent with each other in the successive epidemics, and in all the countries visited by it. Exceptional instances of its outbreaks or of unaccountable security from its propagation, which have puzzled numerous persons who have theorized concerning the causation and habits of this pestilence, need not and do not interfere with or prevent the most exacting and logical studies and deductions relating to the epidemic phenomena, the essential factors of causation, and the natural laws of this destructive disease. All human experience during the past fifty years teaches the same uniform lessons concerning the sanitary and preventive measures that have been found available in staying the progress and fatality of this destroyer; and whether these lessons were taught by mere experience and empirical observation, or by experiment and the most logical deductions of sanitary science, they are found to harmonize with each other. The vexed questions relating to personal contagion and of contingent transportability cease to be regarded as exclusive causes when the total history of any one of the great pandemic marches of cholera comes under review. Each of the essential factors of causation comes into view more or less distinctly, and in the broader studies of successive epidemics these factors admit of clearer and clearer definition, while the total phenomena, with the best grouping which the events of the pestilence admit, prove that the cholera is governed by natural laws which are becoming sufficiently well understood to give as great exactness to sanitary measures against it as can be given to the preventive measures against any other epidemic kind of disease.

The eight distinct periods of widespread epidemics of cholera in the States of North America have been associated with similar periods of its prevalence in Europe, and, as Mr. Simon, the profoundly versed hygienist of the Privy Council of England has remarked of the cholera and other infectious epidemics upon the continent of Europe and in Great Britain, so it may be said of the cholera in America; — namely, that "contagia which are current on the continent are current here," — so that practically it matters not that all the officers of health and all the waterside police of the commercial countries which interchange the germinal contagia or infection of diseases after all have utterly failed to detect with certainty the individuals or the ships by which the disease arrived and gained its first foothold. Yet, fortunately for the general demonstration of the truth concerning the transportation of the germinal cause of cholera, there have not been wanting many well attested instances of such transportation of the disease by persons arriving from infected places with cholera. The speedy and destructive following of this disease in localities so visited by its carriers, and the successive stages of distribution from the foci thus established, while all other places enjoyed entire immunity, has, in a vast number of instances, clearly proved all that can be logically required in the line of events which would be mathematically and logically probable concerning such directly traceable events in the chronology of a pestilence which for its propagation depends upon several factors, only one of which is germinal or infective. The events at the little port of Sunderland in England in 1832 and 1848, at Liverpool and Bristol in 1866, at New Orleans and the Mississippi River landings in the winter of 1848–49, and the repeated illustrations in the chief ports of the Red, the Mediterranean, the Black, and the Caspian seas; and especially the history of this disease upon the island of Sicily in 1866, and both by and among the United States troops in 1866 and 1867, as faithfully portrayed in the two official reports issued by the Surgeon General of the Army.[1] Fortunately for mankind the complex elements of great truths and the relationships of comprehensive principles in relation to the causation and the prevention of a pestilence so destructive and so vitally important for the lessons and warnings it gives, has not been found wholly obscured in mysterious uncertainty as regards its causation and the natural laws or conditions which govern its propagation. Though spread from country to country by human intercourse, its propagating or germinal attribute is now known to be so largely dependent upon local and variously contingent circumstances that the precise knowledge of these collateral or circumstantial conditions has been matter of chief concern and sanitary treatment.

At the port of New York more conspicuously than at any other great centre of population and commerce, the fact has been completely demonstrated that the arrival of persons sick and dying with Asiatic cholera, and the arrival of ships infected with cholera, presumably and in such a degree as ships may be actually infected or be the carriers of cholera infection, do not and need not inevitably or even usually be the harbingers of an epidemic of the disease. In no less than sixteen years out of the last forty-one, and even for

[1] *Circulars* No. 5, 1867, and No. 1, 1868, *War Department, Surgeon General's Office.*

the half century, have both ships and emigrants with cholera arrived and been brought under sanitary treatment at the Quarantine establishment of the State of New York. In four of the sixteen years it is not doubted that cholera spread from such *importation* of a germinal cause, but after a careful and most scrupulous study of all the facts which have been accessible to the writer, there seems to be no probability that cholera was spread extensively from ships and persons arriving at the port of New York in any other than the years 1832, 1848–49, 1854, and 1865–66. It is not proved, by any line of direct evidence, that the epidemics of the years first mentioned actually depended upon fresh importations, but we are warranted in stating that the events which occurred in the years last mentioned at the ports of New York, Quebec, and New Orleans fully warrant the conclusion that the exotic cause of the disease was distributed from these ports. From the beginning of June until the succeeding autumn, in the year 1832, ships freighted with emigrants sick with cholera continued to arrive at the ports of New York and Quebec, and as they speedily dispersed upon every line of travel throughout the States, the cholera attended them, and in their wake it followed as an epidemic. Whether by the canal barges, crowded with these emigrants, which left the port of New York for the western canals, or by the boats from Quebec for Champlain or the western lakes, the immediate following of cholera and the creation of vast numbers of new foci for the epidemic, became the very first line in the history of the epidemic in America. Again in 1848–49, beginning at New Orleans immediately upon the arrival of cholera-infected emigrants from Havre, in December, 1848, the epidemic took its course up the Mississippi and its great tributaries, and in a single fortnight, at dates which in each river port corresponded with the first week after the arrival of steamboats with the first cholera patients on board, the disease made its outbreak. In river towns a thousand miles distant from each other, the epidemic made its appearance at the same time in those instances in which the first cholera patients arrived by the steamboats in the respective localities at about the same date. Surviving the winter, the propagating attribute of that great epidemic continued its ravages during the years 1849 and 1850. But from the ports of New York and Quebec no extension of cholera was propagated until the succeeding month of May, when the events of 1832 were repeated.

The events of 1854 repeated the historical and epidemical facts of 1848–49. The numbers of infected ships and cholera-sick emigrants were scarcely less than those of the latter period. But it was noticeable that the propagation of the disease and the establishment of new points of epidemic prevalence and departures were apparently less certain to ensue upon the arrival of persons sick with cholera in distant localities. But if it was less virulent as a pestilence in 1854 it still evinced its attributed power of germinal propagation throughout a longer period without exotic renewal. It spread to Central America and up and down the Pacific coast, and was repeatedly re-imported from Central America (by way of the port of Aspinwall) to the Quarantine grounds on Staten Island, and there renewed its locally epidemic phenomena by extending its destructive power throughout the greater portion of that

area of thirty acres, but chiefly in the hospital buildings occupied by convalescents from fever and by the sick or convalescents of small-pox. The writer of this paper and the late Dr. Alexander F. Vaché, his official predecessor in the superintendence of those hospitals and grounds, were witnesses of these events.

The events of 1865–66 are fresh in memory, and their historical record is remarkably clear and instructive. That record needs no recital in this place. Interpret it as we may, the successive and widely diversified and distantly separated events in the experience of that visitation of cholera demonstrated the practicability of dealing with the transportable and exotic or germinal factor of the pestilence as an enemy to be held in restraint, and its propagating attribute to be destroyed — a pestilence to be *stamped out* by definite hygienic means. The local factors of epidemic cholera, the environment which insured the fatal sweep of the pestilence in 1832, 1848–49, 1854, and 1866, have been everywhere correctly described; as to these local circumstances they were the same in the ten other years in which cholera patients arrived at the Quarantine grounds in the port of New York, but which arrivals were followed by no extension of the disease over this country. The one great and determining fact in regard to the epidemic or the non-epidemic following in the fifteen years in which persons sick and dying with Asiatic cholera were brought into our port is this, namely, that in the epidemic years the number of such sick and dying emigrants arriving in port was enormously larger, and the number of persons infected with cholera who failed to be detained and prevented from travel beyond the harbor of New York admits of no estimation, because the condition of dangerous infectedness admits of no positive definition within the limits which must, in the travel and business of the world, be overpassed by multitudes of travellers, as respects any external sanitary restrictions in the chief ports and commercial towns.

The prevalence of cholera throughout a vast extent of the great River Valley of the West in the year 1873 has confirmed the belief that the direct connection between a great epidemic of this pestilence and any exotic source at a particular port or place to which it was introduced may not in every epidemic be ascertained. Even if the time of connection with an *exotic* germinal cause were never discovered, it is important to be accurately informed if any infectious property pertained to this last epidemic, as well as to know, also, if the circumstances of localities and of the season were particularly characterized in any such way as to indicate definitely the sanitary conditions of exposure to or of protection from an outbreak of cholera. Viewed in this aspect the inquiries as planned by the American Public Health Association, and patiently pursued by two of its members, Dr. Ely McClellan, Assistant Surgeon United States Army, and Dr. A. B. Judson, whose contribution of reports to this Association bear testimony to the great value of such voluntary researches, will henceforth be esteemed of great value in epidemiology. Though the exact line of relationship between this remarkable visitation of cholera and an exotic source may not be discovered or may not in fact exist, still the epidemic has conformed to such laws and habits, and has illustrated such truths in the causation and progress of a destroying pestilence that it is plainly a duty of the Association to publish the results of this great inquiry.

The prevalence of very destructive epidemics of cholera in limited districts, without a completely demonstrated connection with an exotic germinal cause, has been witnessed in several instances in the United States. Such, for example, was the epidemic in Wheeling, West Va., in 1833; in Cumberland, Md., and in Pittsburg, Pa., at a later period; and in the widely extended but strikingly localized epidemic which in 1852 prevailed in numerous places in Illinois, Indiana, Kentucky, and Tennessee.

The epidemic of 1873 has differed chiefly from those last mentioned by the vastly greater extent of its prevalence. Already its ravages have been definitely reported in more than two hundred places in no less than thirteen States of the Union; and concerning these and many other instances of the somewhat limited prevalence of epidemic cholera, we may be compelled to believe that no direct and completely unbroken line of dependence upon an Asiatic and trans-European communication of the exotic element of causation is likely to be demonstrated. Yet the careful students of cholera epidemics will not be unprepared to believe in such a line of connection if even the first connecting link in the chain of events in the epidemic should be ferreted out at New Orleans as the first, and, as now appears to be probable, the only American port from which cholera took an epidemic departure into the interior States. That first, but, up to this date, that undiscovered link in the chain of events which would connect this cholera epidemic of 1873 in the Mississippi Valley with that which for a year has ravaged the provinces of southern Russia, and swept through Hungary and Austria, may never be found, and though there may be very great probability that such a connecting event has occurred, is not necessary to the etiological history of this cholera if, as Dr. Pelikan of Russia, and Dr. Tholouzan of Persia believe, the exotic germinal cause of cholera actually survives, through succession, years after being introduced to foreign lands and to climates as inhospitable as those of Russia and the Danubian provinces. We state this hypothetically, and certainly we need not regard it as an essential matter, because the proof is so conclusive upon the affirmative side of the question: "Is cholera dependent upon a transportable germinal factor as an essential element in the causation of its epidemics?" But in a great number of instances in which diligent investigation has been made concerning the causation of the most isolated outbreaks of cholera, the fact has been ascertained that even in such cases the line of connection and transportation may be complete and indisputable. This has been found true in a vast majority of the instances in which this kind of investigation has been practicable.

The enlargement of the question, "Is the outbreak of pestilential cholera in any place in America to be attributed to the exotic germinal cause that sprang from India?" must be so extended as to embrace the still unanswered query, How long, and in what places may the exotic and infecting elements of the cause of epidemic cholera linger and exercise their propagating power?

At last the probability which had all along — from 1832 until now — been admitted, has become an almost indisputable certainty, that this propagating factor, which is exotic, does tend to fix itself in certain localities in such manner as to survive during successive years in countries beyond the limits of the

native habitats of the cholera. This conclusion, which Dr. Pelikan, the eminent head of the Sanitary Service of Russia, has announced as a logical deduction from comprehensive and thorough investigations respecting the course of various epidemics and local outbreaks of the disease, is one of the most important of all the deductions in the half-century investigations into the laws which govern this pestilence.

Now without at once accepting this deduction of the very strongest kind of a probability as being a final settlement of the question of the survival and partial or temporary naturalization of the exotic pest which certainly originated in India, it is manifestly prudent to accept and act upon sanitary problems which this deduction from large and practical observations have seemed to force upon us. This certainly is prudence, for the fact, which holds true the world over, that the places and local conditions of unhealthfulness which not only are the hot-beds of cholera when epidemic, but which nurture and preserve its germinal cause whenever and wherever it survives from one year to another, are such places and environments as do most harm to the general health of the people who dwell therein ; and, consequently, whatever sanitary proceedings may be enforced to reform them, by way of guarding against the cholera and its germinal forces that survive through inactive periods — whether they be periods of cold or of drought — will prevent not only the resuscitation of such pests, but will at the same time extinguish the local and general causes of enteric fevers and diarrhœal maladies, and thereby very greatly and permanently promote general healthfulness.

The fact that in the eastern and southern provinces of European Russia, and throughout the Danubian regions, and so on eastward to the Caspian Sea, the exotic germinal cause of cholera seems to survive through two or three years is, perhaps, less singular than would be its survival through successive seasons in any portions of the United States,[1] for the former are nearer the routes and sources of frequent renewal of the transported cause. But there is, even in these United States, so much evidence of the survival and lingering of the exotic factor of the epidemic through two or more years that as the case now stands, Dr. Pelikan's view of this subject would seem to be the correct one.

Whether, therefore, the fearful possibility of the revivification of cholera, or the strong probability of damage from the local sources of fatal fevers and enteric maladies incite the needed sanitary activity, the extinguishing of all collateral causes, and the removal of hot-beds and nurseries of the cholera germs, are public obligations which no community can be justified in neglecting. In thus giving reasonable credence to the presumption that the exotic factor by which the Asiatic cholera is introduced and spread widely upon the

[1] This ability and tendency to survive is characteristic of nearly if not quite all the pestilential poisons. Even the germinal attribute of the yellow fever infection, as well as that of relapsing fever, and most conspicuously those of typhus, typhoid, and the exanthematous fevers do so survive if helped by local circumstances. Cholera and the enteric fever called typhoid are so allied in the kinds of soil and the filthy surroundings in which each of them is most rapidly propagated and fostered that we do no violence to the logical principles of etiology when we accept this doctrine of survival and recrudescence of the germinal attribute or factor of epidemic cholera.

continents beyond the peninsula of India survives through successive years, we do not wholly dismiss from the mind the possible discovery of circumstances which must modify that hypothesis. It is chiefly important that all sanitary authorities should clearly understand the ascertained facts concerning the causation and epidemic propagation of this Asiatic scourge, and that they promptly deal with them by the most effectively preventive means.

The three great conferences or conventions which have been convoked by the students of cholera epidemics, and the doctrines of hygiene, namely, the Cholera Conference, so called, at Constantinople in 1866, that at Weimar in 1867, and the International Sanitary Congress at Vienna in 1873, have most conspicuously, and without any predetermination or concert of action, by the successive congresses, arrived at, and promulgated the same essential conclusions and the same formulas of advice in respect of preventive sanitary measures and the means for extinguishing or controlling the disease.

The International Conference at Constantinople, it will be remembered, was convened upon an official solicitation issued in the autumn of 1865, by M. M. Drouyn de l' Huys, Minister of Foreign Affairs, and Armand Behic, Minister of Public Works of the French Empire. The session of that Conference opened on the 13th of February, 1866, and was closed on the 21st of May; the thirty-three propositions upon which the conference announced definite conclusions respecting the origin, endemicity, transportability, and propagation of cholera.

These conclusions, and the precise questions to which they relate may be concisely stated as follows: —

I. *Where did the Cholera, known as Asiatic, originate, and where is it now endemic?*

Conclusion: Asiatic Cholera, which has at different times run over the whole world, had its origin in India, where it had its birth, and where it exists as an endemic.

II. *Except in India, does the Asiatic Cholera exist in any part of the world in an endemic form?*

The invading Cholera has always come from abroad and has not been spontaneously developed in the countries enumerated, except in India.

III. *Is there reason to believe that Cholera may acclimate itself in our countries?*

The Commission regards it as problematical without rejecting the possibility of the fact.

IV. *Is there in the Hedjez an original focus of Cholera, periodic or permanent?*

It appears, up to the present time, to have been always imported from without.

V. *Are there certain localities in India particularly favorable to the development of Cholera, or exclusively generating it?*

There are in India certain localities, principally in the valley of the Ganges, where Cholera is endemic.

VI. *Do we know the concurrent causes by which the Cholera originates spontaneously in India, and the circumstances which make it take on an epidemic character?*

The permanence of the disease in certain localities should be explained only by something inherent in the places themselves. We do not know the special conditions under the influence of which Cholera originates as an endemic.

VII. *What are the circumstances which concur in the development and propagation of the epidemics of Cholera in India?*

The most powerful of all the causes are the pilgrimages.

VIII. *Is the transmissibility of Cholera proved?*

The transmissibility of Asiatic Cholera is an incontestable truth.

IX. *Are there conclusive facts which force us to admit that Cholera can propagate itself to a distance by certain states of the atmosphere, by winds, or changes of the surrounding medium?*

No fact has proved that Cholera thus propagates itself.

X. *How is its importation effected, and by what agents transmitted?*

Two conditions are necessary; an arrival from an infected district and circumstances favoring transmission.

XI. *Under what conditions does man import Cholera?*

Man affected with Cholera is himself the principal agent in propagating the disease, and a single cholera patient may cause the development of an epidemic.

XII. *Conclusion:* Facts tend to prove that a single individual (and with much greater reason, many) coming from an infected place, and suffering from diarrhœa, may give origin to a Cholera epidemic, in other words that the premonitory diarrhœa may transmit Cholera.

XIII. *What is the length of the period of Incubation?*

It does not exceed a few days.

XIV. *Can Cholera be imported and transmitted by living animals?*

It is not known.

XV. *Can Cholera be imported by clothing and articles in common use?*

Cholera may be transmitted by such articles coming from an infected place, especially by those which have been used by a Cholera patient.

XVI. *Can Cholera be imported and transmitted by merchandise?*

The affirmative and negative votes of the Commission stood sixteen to six.

XVII. *Can the dead bodies of Cholera patients import and transmit Cholera?*

It is prudent to consider them as dangerous.

XVIII. *What influence do the different modes of communication, by land or sea, have upon the propagation of Cholera?*

Maritime communications are, by their nature, the most dangerous; next come those by railroads.

XIX. *What influence have deserts upon the propagation of Cholera?*

The Commission believes that this disease has not been imported into Egypt or Syria across the deserts by caravans from Mecca.

XX. *What is the influence of crowding together of human beings on the intensity and propagation of Cholera epidemics?*

The rapidity of the extension of the disease is proportionate to the concentration of the aggregated mass . . . . in a dense crowd the more rapid the extension the more prompt is the cessation of the epidemic.

XXI. *What is the intensity and the tenacity of Cholera epidemics on shipboard?*

The intensity is in general proportionate to the crowding; and the Commission adds: "The danger of importation by vessels and of giving rise to an epidemic are not entirely dependent on the intensity of the epidemic on board."

XXII. *What influence does an accumulation of persons in lazarettos (from a focus of Cholera) have upon the people so detained?*

Such accumulation and detention have the effect of extending the disease among the inmates.

XXIII. *What influence do armies, fairs, and pilgrimages exercise upon the propagation of Cholera as an epidemic?*

They are among the most certain means of the propagation of Cholera, and they constitute great epidemic foci.

XXIV. *What is the influence of dissemination on the intensity and development of Cholera?*

The dissemination (of infected persons) gives rise to great danger of propagating it, but may render less violent an epidemic that has appeared in a crowd.

XXV. *What share does the pilgrimage of Mecca take in the Cholera epidemics?*

Twice this disease has been imported into Egypt and countries bordering on Europe by the pilgrims.

XXVI. *What are the assisting causes of Cholera?*

Misery and its consequences, the crowding of individuals, impaired health, want of ventilation, emanations from soil impregnated with organic matters, especially from Cholera dejections, the sewers, privies, and contaminated water. The soil of a locality once impregnated with Cholera dejections, is able for a considerable time to retain the property of disengaging the principle of the disease and thus keeping up an epidemic.

XXVII. *How is immunity from the Cholera to be understood?*

There exists in a healthy man a resistance capable of neutralizing the toxic agent; and this resistance, weakened among miserable populations and in individuals debilitated by any cause, may, by the increase of easy circumstances and by good hygienic measures, be generalized to the point of rendering Cholera a disease but little to be feared. But, unfortunately, we are far from this, and it is for this reason that measures of isolation are, and will yet be for a long time, necessary.

It must be very well known that Cholera, although transmissible, does not attack fatally all the individuals exposed to its influence; that a well-regulated life, good hygienic conditions, are almost certain guaranties against its action; that it rages by preference in unhealthy localities, among populations weakened by misery and among individuals undermined by disease or excess.

The immunity which certain localities enjoy, that is to say, the resistance, permanent or temporary, general or partial, opposed by these localities to the development of cholera within their limits, is a fact which does not exclude transmissibility, but which indicates that certain local conditions, not yet entirely determined, are an obstacle to the development of the disease.

In the same way the immunity, more or less complete, and more or less durable, which the majority of persons in the midst of a focus of Cholera enjoy, an immunity which attests the individual resistance to the toxic principle, is a circumstance to which we should attach the highest importance.

In the point of view of epidemic development, it is the corrective of transmissibility; and viewed with regard to prophylaxia, it sets in operation proper means to arrest the ravages of the disease.

XXVIII. *From the facts which relate to the genesis, the propagation and the transmission of Cholera, can we draw any precise conclusion with regard to the generative principle of the disease, or at least the media which serve as its vehicles or receptacles, the conditions of its penetration into the organism, the ways by which it passes out, the duration of its morbific activity, in a word, all its attributes a knowledge of which is important in order to guard against it?*

We can only frame hypotheses as to the nature of the generative principle of Cholera. We know only that it is a native of certain countries of India and that it dwells there permanently; that this principle is reproduced in man, and accompanies him in his peregrinations; that it may also be propagated to a distance, from country to country, by successive regenerations, without ever being reproduced spontaneously outside of man.

XXIX. *What are the vehicles of the generative principle of Cholera?*

To this question facts answer, that the air is the principal vehicle of the cholera principle. The rapid spread of the disease in an infected locality; the simultaneousness of a great number of cases in a given assemblage of people, where mediate or immediate contact with those first taken sick was not possible; the general influence which in the time of an epidemic weighs more or less upon individuals placed within the limits of the infected district, all these circumstances prove, that, in fact, the surrounding air is the principal vehicle of Cholera. The principle of Cholera then is volatile, and acts in this respect after the manner of miasma; that is to say, by infecting the atmosphere.

XXX. *To what distance from a focus of emission can the principle of Cholera be transported by the atmosphere?*

The surrounding atmosphere is the principal vehicle of the generative agent of Cholera; but the transmission of the disease by the atmosphere, in the immense majority of cases, is limited to a very short distance from the focus of emission.

XXXI. *Besides the air, what are the other vehicles of the Cholera principle?*

Water and certain ingesta may also serve as vehicles for the introduction into the organism of the generative principle of Cholera.

This granted, it follows, so to speak, necessarily, that the passages by which the toxic agent penetrates the organism are principally the respiratory passages, and, very probably, also the alimentary canal. As for penetration through the skin, nothing tends to prove it.

Adopted unanimously.

XXXII. *What are the principal receptacles of the Cholera principle?*

The matter of Cholera dejections being incontestably the principal receptacle of the morbific agent, it follows that everything which is contaminated by

these dejections becomes also a receptacle from which the generative principle of cholera may be disengaged, under the influence of favorable conditions; it follows also that the production of the cholera germ takes place very probably in the alimentary canal, to the exclusion, perhaps, of all other parts of the system.

XXXIII. *What is the duration of the morbific activity of the generative principle of cholera?*

It results from the study of facts, that in the open air the generative principle of cholera loses rapidly its morbific activity, and that such is the rule; but that, under certain peculiar conditions of confinement, this activity may be preserved for an undetermined period.

The deliberations of the Cholera Conference at Constantinople partook largely of the nature of judicial proceedings in regard to the precise nature and weight of evidence. The interests of nations, the safety of armies, and the claims of humanity awaited, in some sense, the conclusions that were reached. Sanitary works, and not dogmas, were well defined in the thirty-three Conclusions of that Conference.

The Cholera Conference at Weimar was a voluntary convocation of scientific observers and students who, in numerous epidemics, had pursued their practical inquiries with all the zeal of naturalists, as well as with the noble purposes of public-spirited citizens intrusted with great duties. It assembled at Weimar in April, 1867, — forty nine eminent medical men and sanitary officers joined in the deliberations, in which the observations, opinions, and theories of each gentleman were freely sifted and compared. The chief points which received full examination, and the bold declaration of opinion by the members in conference related to: —

(1.) The evidence of transmission of an infectious cause from place to place.

(2.) The uselessness of town quarantines.

(3.) The causes of local and house epidemics of cholera.

(4.) Causes for the immunity of particular localities and particular houses from the epidemic.

(5.) Certain relations of well waters, soils, localities, and seasons to the prevalence of cholera.

(6.) Observations relating to germinal causes and the several factors which act together in producing and propagating cholera.

Agreeing very generally with the conclusions announced by the conference of the previous year at Constantinople, the exceptional cases in cholera outbreaks were allowed such prominence as would tend to awaken renewed investigations and a broader study of the factors of causation. Conclusions were announced respecting the best preventive measures, and the means for extinguishing the active germinal or infectious attribute of the epidemic. The conclusions and recommendations relating to disinfectants, and the modes of their application were concisely given, as follows[1]: —

1. "The Conference expresses, as its deliberate conviction, that the efforts

[1] See *Report of the Cholera Conference at Weimar*, Munich, 1867.

to arrest and prevent cholera by disinfectants should be continued in the most energetic manner.

2. "Disinfection will be entirely successful only where excremental matters are carefully gathered and kept from being cast about; when attention is given to cleanliness and the means of health, and when the *disinfection is performed by sanitary authorities in a compulsory manner.*

3. "Wherever the entire locality or district cannot at once be disinfected, it is advisable to *disinfect throughout the places visited by the previous epidemics of cholera.*

4. "The general disinfection should be performed at the proper time, that is, before the epidemic is actually prevalent in the town or place. Every house or spot that becomes infected, or is suspected to be so, must be kept constantly under the influence of disinfectants.

5. "In regard to the best substances to be used as disinfectants, there have been found no more effectual materials than sulphate of iron (copperas) and carbolic acid; and, as experience proves, we have no other disinfectants that can be employed with greater facility. A combination of both these disinfectants is therefore recommended.

6. "The disinfection of clothing that has been infected by cholera excrement is especially an important matter. For that purpose, the Conference recommends that all such clothing be disinfected by boiling in water, or by chemical treatment in a proper solution of 'zinc vitriol' (sulphate or chloride of zinc); and the Conference also recommends that special arrangements be made by which disinfection can be employed in all places, and at any hour, especially among or for the poor.

7. "If cholera infects any house or spot, it is recommended that, if practicable, the houses so situated in an infected place, or being infected, should be vacated, and that their inhabitants should be removed from the infected spot.

8. "It is especially recommended that the ground-water about dwelling-houses, and all the grounds about buildings of every kind, should be kept undefiled by any excremental matter of cholera; also that all drinking-water be undefiled and pure; and where no pure water can be had, that such as must be used for drinking should be disinfected by boiling."

The International Medical Conference at Vienna, which was in session the first eight days of September (1873) during the Great Exhibition of Industry and Art, resulted in no new suggestion or decision respecting preventive measures against cholera. But after an animated review of evidence upon the chief questions concerning the propagation, and especially in regard to the utility of quarantine regulations, the whole discussion culminated in the unanimous reassertion of the transportability of that exotic germinal attribute or element of cholera which is always originally derived from its habitats in India. At the close of the discussions, and when ready to vote upon various resolutions that should set forth the views of the Conference, the chairman put the question, "Can any one who is present present facts against the transportability of cholera?" No person responded.

Between inland countries and in any other than maritime ports that com-

municate with distant ports and places, and with ships and persons which are infected with cholera, all restrictions in the nature of quarantine were declared to be unavailing. The resolutions adopted by the Vienna Conference upon this subject were in substance as follows: —

Resolved — (1.) "That the inland and river quarantine should be abolished.

(2.) "That the sea quarantine should for the present be enforced.

(3.) "That an International Commission should be chosen for the purpose of studying the exotic agent by which cholera is spread, and which, therefore, should be eliminated from every kind of intercourse, so that better measures of protection may be found than those employed heretofore."

All the researches which have hitherto been made concerning the course and causes of epidemic cholera seem to agree in the following sanitary facts: —

(1.) Special and efficient sanitary regulations in all places and thorough methods of cleansing and disinfection are the true safeguards against the visitations of cholera epidemics, and for the commercial countries detentions and quarantines are not generally practicable.

(2.) That to be of any general utility in preventing the diffusion of cholera over the world, the systems of restriction or quarantine would need to be international.

(3.) That the sick and the dead of cholera should be secluded, and that whatever methods of cleansing and disinfection are adopted should be thorough and sufficient, — should secure absolute disinfection, and not merely disinfection in name simply.

At last the habits and the factors in the cause of cholera epidemics are sufficiently well understood to warrant the belief that this pestilential destroyer may be successfully resisted, and its material means of propagation be completely controlled. Medical theories and the hypotheses of naturalists concerning it may differ, be at variance with the facts respecting this epidemic pest, but upon all the points which are essential to the efficiency of sanitary measures the conclusions which are already reached concerning the sources and the preventive means that are now definitely understood are not of a doubtful nature, but are as well known as any of the similar facts in the causation and prevention of any other epidemic disease. We conclude by recapitulating the more essential deductions upon which the official proceedings of sanitary authorities have been based in those cities and towns which have been most effectually protected from cholera, however seriously threatened by it. We may properly regard these as well established

CONCLUSIONS: —

The pestilential cholera of India has, at last, been proved to be amenable to hygienic measures, even in the largest cities and most populous districts of that country. Bombay, Madras, Calcutta, and even the places where Hindoo pilgrims assemble, as well as the encampments and marches of armies in that native home of cholera, are now saved from epidemics of that disease by sanitary regulations. These regulations comprise effectual methods of cleansing and disinfection, the care and proper separation of the sick, and the sanitary care of the dead of cholera; the application of sanitary rules of

public and personal hygiene in the armies, in the movements of pilgrims, and in the encampments, transports, and caravans of Mohammedan devotees *en route* to and from Mecca, seem now to prove adequate to prevent epidemic outbreaks of cholera among those vast assemblages which were, until sanitary care was officially prescribed, the chief carriers of this pestilence throughout southern and western Asia, and thence to the commercial world. All the outbreaks of cholera that have been witnessed since 1865 seem to have been the legitimate consequences of great sanitary neglects. This is believed to be true in Europe, America, and Asia alike.

The course of cholera from the Caspian and Black Sea regions into Russia, Hungary, and the Danubian regions has been largely connected with the water-craft traffic and travelling; and as shown by the best sanitary observers these movements of cholera into and throughout Europe have occurred in such manner as to have been uncontrollable by any practicable system of external or quarantine sanitary measures. But it is in evidence that by means of thoroughly good public health regulations and the general and special means of sanitary care the pestilential spread of cholera has been prevented in all places where such a sanitary government has been found in full operation; and, on the other hand, the absence of such preventive measures has been characterized in every place in which cholera has prevailed in Europe; and it is yet to be shown that this rule has presented any exceptions in the United States during the remarkable epidemic in the Mississippi Valley in the year 1873.

The local conditions associated in the causation of cholera epidemics seem to be indispensably essential factors in the production of their outbreaks and pestilential progress as truly as the germinal exotic factor from India. The verdict of the chief sanitary observers throughout the world has at last become almost unanimous in support of this doctrine. It is conceded that pestilential cholera does not prevail in any country beyond the confines of southern Asia, except in the presence of the germinal factor of the cause which has been more or less recently derived from India, and perpetuated by repropagation; while, on the other hand, it is only in the presence and by the aid of the local conditions of insalubrity that Asiatic cholera can become epidemic and pestilential. Hence the acceptance of the fact that cholera depends upon an exotic germinal factor which requires local and personal conditions of unhealthfulness for its epidemic development, when correctly understood, tends powerfully to incite to diligent efforts by individuals, families, neighborhoods, sanitary authorities, cities, and governments to remove and prevent the local and the general conditions by which the propagation and pestilential spread of cholera is alone made certain or even possible.

General sanitary improvements and good public health regulations, when intelligently directed and applied with the proper degree of scientific exactness and thoroughness, are adequate to repress and prevent epidemics of cholera.

Observations and the closest investigation of all circumstances and records of epidemic cholera wherever it has prevailed, whether in America, Europe, or India, show that it is so emphatically a pestilence of undeniably insalubrious grounds and places and that such places when visited by this malady become foci for the further diffusion of it, that the sanitary duty of reclaiming all such grounds and localities from their unhealthful state and removing the localizing causes of epidemics, and of cholera especially, must be treated as a first rate sanitary duty, which is required of every local public health government, and as an obligation which the State needs to enforce in every portion of its domain in which cholera is most liable to come.

The recent course of cholera throughout the Mississippi Valley has reaffirmed the lessons of all previous epidemics of this disease respecting the supreme importance of pure water supplies in all cities and villages, and of having all wells and water-springs which are used by the people effectually guarded against any possible soakage and contamination from privies and other sources of excremental defilement. It must be concluded that the history of outbreaks of cholera in all parts of the world conspicuously illustrates the reasons for procuring all water-supplies from sources which cannot become defiled by excremental soakage or outflowings in any such way as to be carriers of bowel diseases, — particularly not of cholera or enteric fever.

The impurity of the local atmosphere of a dwelling place, a village, or a particular district, is proved to be a matter of public sanitary concern, and that environed in a polluted atmosphere the palatial homes of wealth and gayety may suffer equally with the tenements of the humblest classes. In the words of the medical officer of the Privy Council of England, "The specific migrating power of cholera, whatever its nature, has the faculty of infecting districts in a manner detrimental to life, only when the atmosphere is fraught with certain products, susceptible, under its influence, of undergoing poisonous transformations. Through the unpolluted atmosphere of cleanly districts it migrates without a blow : that which it can kindle into poison is not there."

Concerning those Sanitary Regulations which are in the nature of restrictive separation of the sick from the well, and of things — whether personal clothing or ships — which are believed to be infected with and capable of communicating cholera poison, it must be confessed that there are practical difficulties in defining and successfully enforcing the most rational measures, and further, that practically, the greater part of all restriction and quarantine regulations have been too absurdly irrational and untrustworthy to be allowed any share in the defenses against epidemic cholera. This allegation cannot at present apply to the quarantine system of the port of New York nor to the restrictive measures which have from time to time been enforced at the ports of Malta and of Sicily. A large experience and careful study of this subject warrant the conclusion that as respects ports of entry and ports

of departure which are at a particular time liable to have cholera, and the exotic cause of cholera in any manner brought upon vessels or among migrants and passengers, sanitary police regulations and certain rational restrictions in the nature of seclusion, cleansing and disinfection of all such sources of infection or carrying of cholera should be enforced. This is the sanitary system of the port of New York.

The utility of disinfectants as preventives of cholera is predicated (1) upon their power to neutralize and destroy the essential cause of cholera, that is, its infective attribute or poison; (2) upon their colytic or antiseptic effect in preventing putrefaction and in neutralizing the foul products of decay and putrescence. Upon this subject no rational doubt any longer exists. The utility of disinfectants and the relative usefulness of different agents for these purposes are demonstrated facts. But the effectiveness and sanitary value of any or all of the chemical agents employed in disinfection depends upon the exact fitness, the sufficiency and thoroughness, and the timeliness of the application. Much that passes for disinfection and sanitary cleansing are such only in name. In these sanitary acts and duties nothing is more true than that "What is worth doing at all is worth doing well."

The supreme importance of giving perfect sanitary care to the very first cases, and groups of cases of cholera, and of persons suffering from diarrhœal disorders wherever cholera is possible, especially the timely and effectual employment of disinfection in all such cases, the most exacting medical supervision and official watchfulness, under local health government, should be understood and practiced in all places where there is a possibility of an outbreak of cholera.

As a final conclusion upon the whole subject of sanitary defenses against cholera, no truth is more important and none more completely established as a basis for official proceedings than this, namely, that common and thorough sanitary improvements and precautions such as every family, every householder, every village, city, district, and state, should always enforce as general and necessary means of protection and improvement of the public health, are the most essential means of protection against cholera, and the only means which, practically considered, are adequate to prevent the Asiatic cholera from becoming an epidemic and pandemic pestilence again and again; and, finally, that the "stamping out" of pestilential cholera consists in the complete execution of all these common hygienic duties, the intelligent administration of sanitary regulations relating to common cleanliness and to special disinfection, the perfect sanitary care of the sick, the assured purity of water-supplies, and the prevention of excremental pollution of the grounds about dwellings and of the common atmosphere. These are ordinary sanitary duties, and it is by an extraordinary promptness, intelligence, and thoroughness in their application that cholera can be stamped out after it has appeared in a community; but by maintaining such sanitary defenses as means of general improvement of the public health the world over, or in any country or city, pestilential cholera will cease its visitations, and wherever such sanitary defenses exist, this stalking terror of all the continents would be known only in the historical records of the past.

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